World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:13, No:01, 2019

Memristor-A Promising Candidate for Neural Circuits in Neuromorphic Computing Systems

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Abstract : The advancements in the field of Artificial Intelligence (AI) and technology has led to an evolution of an intelligent era. Neural networks, having the computational power and learning ability similar to the brain is one of the key AI technologies. Neuromorphic computing system (NCS) consists of the synaptic device, neuronal circuit, and neuromorphic architecture. Memristor are a promising candidate for neuromorphic computing systems, but when it comes to neuromorphic computing, the conductance behavior of the synaptic memristor or neuronal memristor needs to be studied thoroughly in order to fathom the neuroscience or computer science. Furthermore, there is a need of more simulation work for utilizing the existing device properties and providing guidance to the development of future devices for different performance requirements. Hence, development of NCS needs more simulation work to make use of existing device properties. This work aims to provide an insight to build neuronal circuits using memristors to achieve a Memristor based NCS. Here we throw a light on the research conducted in the field of memristors for building analog and digital circuits in order to motivate the research in the field of NCS by building memristor based neural circuits for advanced AI applications. This literature is a step in the direction where we describe the various Key findings about memristors and its analog and digital circuits implemented over the years which can be further utilized in implementing the neuronal circuits in the NCS. This work aims to help the electronic circuit designers to understand how the research progressed in memristors and how these findings can be used in implementing the neuronal circuits meant for the recent progress in the NCS.

Keywords : analog circuits, digital circuits, memristors, neuromorphic computing systems
Conference Title : ICANNS 2019 : International Conference on Artificial Neural Networks Systems
Conference Location : Dublin, Ireland
Conference Dates : January 30-31, 2019

Open Science Index, Computer and Systems Engineering Vol:13, No:01, 2019 publications.waset.org/abstracts/100057/pdf